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(74) Agents: **INGRASSIA, Vincent, B.** et al.; Motorola, Inc.,
P.O. Box 10219, Scottsdale, AZ 85271-0219 (US).

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(71) Applicant: **MOTOROLA, INC.** [US/US]; 1303 East Algonquin Road, Schaumburg, IL 60196 (US).

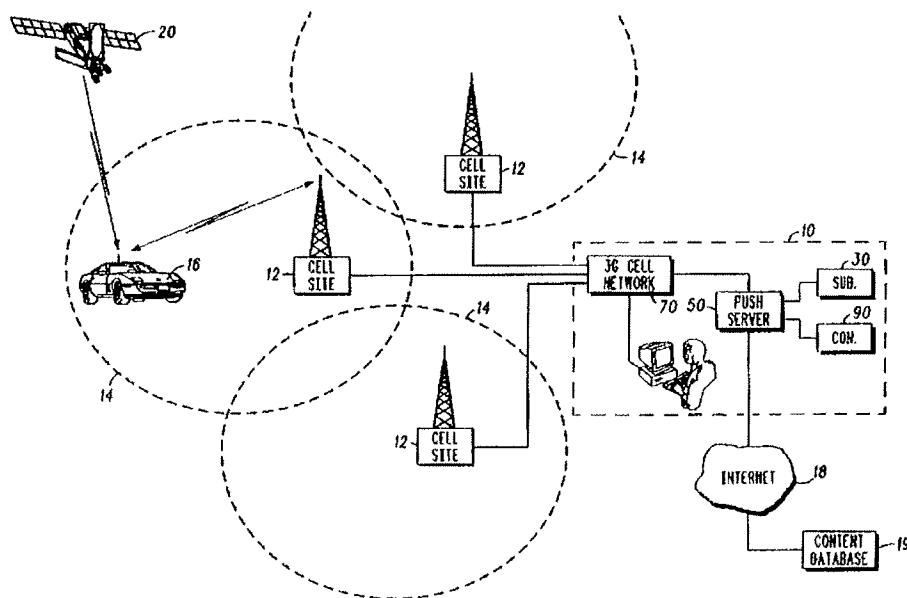
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(72) Inventors: **ARMBRUSTER, Peter, Joseph**; 4941 W. Flint Street, Chandler, AZ 85226 (US). **SHAUGHNESSY, Mark**; 1215 E. Squawbush Place, Phoenix, AZ 85048 (US). **TAYLOR, Daniel, Richard**; 14240 S. 7th Street, Phoenix, AZ 85248 (US).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: MOBILE IP PUSH SERVICE



(57) Abstract: A mobile IP push service system (10) provides proximity related information to mobile subscribers (16). The push service system (10) has a subscription database (30) containing subscriber profile information for the mobile subscribers (16). A push server (50) retrieves the proximity related information based on the subscriber profile information, and a wireless network (70) pushes the proximity related information to the mobile subscribers (16). The proximity related information is pushed based on the subscriber profile information, and the network (70) establishes a continuous connection between the push server (50) and the mobile subscribers (16).



WO 01/95592 A1

MOBILE IP PUSH SERVICE**BACKGROUND OF THE INVENTION****1. Technical Field**

5 The present invention relates generally to packet based cellular networks. More particularly, the present invention relates to a mobile IP push service for packet based cellular networks.

2. Discussion

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 As the internet has rapidly grown in popularity, the availability of and demand for information and commercial services that can be delivered to consumers has also greatly increased. A particularly useful service available via the internet is the "push service". Push services allow Internet-based information to be sent to a subscriber based on a specific subscriber profile. Typically, the profile will include a number of service identifiers and preferences relating to these identifiers. The preferences can be thought of as "triggers" notifying the information provider when to transmit the desired information to the subscriber. The desirability of push services is due in large part to the fact that once the subscriber profile is established, no additional requests for the internet-based information need be made by the subscriber. Thus, a typical push service request will be "page me when XYZ stock drops below 50."

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 With the growing mobility of today's society, it is therefore easy to understand that push services could be extremely useful in a wide variety of mobile circumstances. A particular opportunity for push services to improve everyday life relates to the situation where the Internet-based information is proximity related information. "Proximity related" information essentially means information regarding the mobile subscriber's geographic location. For example, notification of vehicular traffic congestion, alternate route information, and speed trap information would all be useful services to the traveler that is already in route. The geographic location of the subscriber must generally be known, however, before the proximity information can be effectively provided to the subscriber.

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"Mobile IP" refers to movement of a data terminal to a different physical location while maintaining an internet protocol (IP) connection. Mobile IP technology has been defined with respect to "home agents" and "foreign agents", and presents the opportunity to provide previously unavailable location based push services to mobile subscribers. In fact, designing packet based cellular networks to support the mobility of voice and data communications on broadband connections is a central goal of new, wireless networks, such as third generation (3G) cellular networks.

An important aspect of applying push services to cellular networks is the desirability of remaining "continuously connected". This refers to a virtual connection which does not need a call initiation session (such as dialing into the Internet) prior to the transfer of data. Anyone who has been forced to endure a lengthy modem training process when dialing into the Internet can understand the convenience of a continuous connection when dealing with push services. In fact, the speed and efficiency of the overall cellular network would be substantially improved with such a capability.

While push services have been provided over traditional wired connections, consumers are still unable to use these services to obtain location based information in a mobile setting. It is therefore desirable to provide proximity related and time based push services to mobile subscribers via wireless networks, such as 3G cellular systems.

BRIEF DESCRIPTION OF THE DRAWINGS

The various advantages of the present invention will become apparent to one skilled in the art by reading the following specification and appended claims, and by referencing the following drawings in which:

FIG. 1 is a schematic diagram of a mobile IP push service system according to the present invention;

FIG. 2 is a flowchart of a method for transmitting proximity related information to a mobile subscriber according to the present invention;

FIG. 3 is a flowchart of a method for retrieving proximity related information based on subscriber profile information according to one embodiment of the present invention; and

FIG. 4 is a flowchart of a method for retrieving proximity related information

based on subscriber profile information according to an alternative embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

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Turning now to FIG. 1, a mobile IP push service system 10 is shown in accordance with a preferred embodiment of the present invention. It is important to note that FIG. 1 illustrates a highly simplified diagram of the mobile IP push service system 10, and that system 10 includes a number of cell sites 12 serving any number of cells 14 and mobile subscribers 16. Although the present invention is applicable to push services providing all types of information, the push service system 10 of the present invention preferably provides proximity related (or location based) information to mobile subscribers 16.

Specifically, the push service system 10 includes a subscription database 30, at least one push server 50, and a wireless network capable of data transmission, such as a third generation (3G) cell network 70. The subscription database 30 contains subscriber profile information (such as services and preferences) for mobile subscribers 16 located in the coverage area of cells 14. The push server 50 retrieves proximity related information that is relevant to the mobile subscribers 16 based on the subscriber profile information. The 3G cell network 70 pushes the proximity related information to the mobile subscribers 16. The content of the proximity related information that is retrieved and pushed to the mobile subscribers 16 is based on the subscriber profile information contained in the subscriber database 30. It is preferred that the network 70 establishes a continuous connection (i.e. mobile IP connection) between the push server 50 and the mobile subscribers 16 in accordance with cellular networking techniques described below and other techniques well known in the art.

It is preferred that the push service system 10 obtains the proximity related information via an Internet connection 18, but as will be discussed below, the proximity related information may also be obtained from other mobile subscribers 16. The push service system 10 may also include a content database 90 for storage and indexing of the proximity related information. The proximity related information can reside in the content database 90 until a particular subscriber service requires its retrieval. A particularly desirable aspect of the content database 90 is the ability to index the

information contained in the content database by geographic location. The proximity related information is therefore retrievable from the content database 90 or the content database 19 via the Internet connection 18 based on subscriber location information.

For example, the push server 50 may store consumer product pricing information (such as refrigerator prices) in the content database 90 as proximity related information. The content database 90 would therefore contain the locations of refrigerator retailers and the refrigerator prices offered by the retailers. The mobile subscriber 16 could request to be notified when in the vicinity of a certain refrigerator for a certain price, and the push service system 10 would push a notification to the mobile subscriber 16 when the subscriber location information indicates that the retailer is nearby. It is preferred that the subscriber location information is generated at the mobile subscriber 16 via a GPS receiver coupled to the subscriber 16 and operating in conjunction with a GPS satellite 20. It is important to note that cellular technology currently provides subscriber location information at the cell level. Use of GPS, however, would provide much finer resolution to the subscriber location information.

It will be appreciated, however, that many mobile subscribers 16 will not have GPS capability. Therefore, in a first alternative embodiment, the network 70 can include a plurality of system broadcast antennas, which may or may not be part of the cell network 70, transmitting the proximity related information to all mobile subscribers in an immediate area of the antennas. Each system broadcast antenna will therefore be responsible for broadcasting proximity related information to only the mobile subscribers in the immediate area. Subscriber preferences will be maintained at the subscribers 16 such that only the content of interest will be displayed to each user. It will be appreciated that while this approach adequately addresses the problem of GPS receiver unavailability, a much larger number of antennas will be needed than under the preferred approach. A second alternative embodiment involves the cell network 70 determining the subscriber location information as the subscriber 16 registers its location. This would occur as part of normal system location updates or as part of normal subscriber call activity. As already noted, however, such an approach would not provide the level of resolution available from GPS based approaches.

Operation of the mobile IP push service system 10 will now be described in greater detail. FIG. 2 demonstrates a method 100 for transmitting proximity related

information to a mobile subscriber. At step 110, subscriber profile information is determined for the mobile subscriber. The subscriber profile information can be stored in the subscription database, and may include services information as well as preferences information with regard to the desired services. It should be noted that in
5 the first alternative embodiment, profile information is stored in the subscriber itself. Storing the subscriber profile information at step 112 allows the preferences and services to be updated by the user as needs change.

It can also be seen that at step 130 a continuous connection is established with the mobile subscriber. At step 140, the proximity related information is retrieved based
10 on the subscriber profile information. It will be appreciated that the present invention also allows for "time tagging" the push services such that a mobile subscriber receives proximity related information only during certain time periods. An example of the use of this service may be a subscriber profile indicating a preference for Italian food and a desire to receive Italian restaurant information based on his proximity to those
15 restaurants only during the hours of 11:00 to 12:30. Since the mobile subscriber is reachable by mobile IP, his location may be requested by the push server only at these specific times, thus reducing battery power and network congestion. Step 120 therefore provides for determining whether an allowable time period has been encountered for the specific mobile subscriber. If an allowable time period has been
20 encountered, the proximity related information is pushed to the mobile subscriber based on the subscriber profile information at step 150.

As already noted, the push server can either obtain the subscriber location information using current cellular technology, from a GPS-type receiver coupled to the subscriber, or by transmitting the proximity related information to system broadcast
25 antennas. FIG. 3 demonstrates the process of retrieving the proximity related information when the source of the location information is a GPS-type receiver. Thus

effective when the subscriber location information can be retrieved from a subscriber GPS receiver. Control is then transferred to block 120 of FIG. 2.

FIG. 4 demonstrates step 140' when there is no subscriber GPS receiver. In such case, the proximity related information is stored at step 142 and transmitted to a system broadcast antenna at step 148. The antenna broadcasts the proximity related information to all mobile subscribers in an immediate area of the antenna. Under this embodiment, it is preferred that the proximity related information be coded such that only selected subscribers can use it. Control is then transferred to block 120 of FIG. 2.

It will be appreciated that the system may also allow the opportunity for subscribers to provide pertinent information to the server, such as notification of vehicle congestion in the subscriber's vicinity. The mobile subscriber could select the type of information to be input, and the subscriber device would append its current GPS location, then send it to the push server 50 via the 3G cell network 70. An incentive to do this would be given to the mobile subscriber 16 by, for example, reducing the subscription fee for each piece of information delivered. Thus, the push server 50 can obtain the proximity related information from other mobile subscribers.

The foregoing discussion discloses and describes exemplary embodiments of the present invention. One skilled in the art will readily recognize from such discussion, and from the accompanying drawings and claims, that various changes, modifications and variations can be made therein without departing from the spirit and scope of the invention as defined in the following claims.

CLAIMS

What is claimed is:

1. A method for transmitting proximity related information to a mobile subscriber comprising:

5 determining subscriber profile information for the mobile subscriber;
 retrieving the proximity related information based on the subscriber profile information; and

 pushing the proximity related information to the mobile subscriber based on the subscriber profile information.

10 2. The method of claim 1 further including:
 storing the proximity related information to a content database;
 retrieving subscriber location information, the subscriber location information defining a geographic location of the mobile subscriber; and

15 searching the content database for the proximity related information based on the subscriber location information.

20 3. The method of claim 2 further including searching the content database for vehicular traffic congestion information.

 4. The method of claim 2 further including searching the content database for speed trap information.

25 5. The method of claim 2 further including retrieving the subscriber location information from at a cell level.

 6. The method of claim 5 further including retrieving the subscriber location information from a GPS receiver coupled to the mobile subscriber.

30 7. The method of claim 2 further involving updating the subscriber location information at a predetermined update rate.

-8-

8. The method of claim 2 further including updating the subscriber location information based on a distance moved by the mobile subscriber.

5 9. The method of claim 1 further including transmitting the proximity related information to a system broadcast antenna, the system antenna broadcasting the proximity related information to all mobile subscribers in an immediate area of the broadcast antenna.

10 10. The method of claim 9 further including coding the proximity related information such that only selected subscribers can use the proximity related information.

15 11. The method of claim 1 further including establishing a continuous connection with the mobile subscriber.

12. The method of claim 1 wherein the subscriber profile information includes time period limitations, the method further including restricting the pushing of the proximity related information based on the time period limitations.

20 13. The method of claim 1 further including storing the subscriber profile information to a subscription database.

25 14. The method of claim 13 wherein the subscriber profile information includes services information, the method further including storing the services information to the subscription database.

15. The method of claim 14 wherein the subscriber profile information includes preferences information, the method further including storing the preferences information to the subscription database.

16. A method for retrieving push service proximity related information based on subscriber profile information for a mobile subscriber comprising:

storing the proximity related information to a content database;

5 retrieving subscriber location information, the subscriber location information defining a geographic location of the mobile subscriber; and

searching the content database for the proximity related information based on the subscriber location information.

10 17. The method of claim 16 further including establishing a continuous connection with the mobile subscriber.

18. The method of claim 16 further including searching the content database for vehicular traffic information.

15 19. The method of claim 16 further including retrieving the subscriber location information from a subscriber GPS receiver coupled to the mobile subscriber.

20 20. The method of claim 16 further including retrieving the proximity related information from other mobile subscribers.

21. The method of claim 16 further including retrieving the proximity related information from an internet connection.

25 22. A mobile IP push service system comprising:
a subscription database containing subscriber profile information for mobile subscribers;

a push server for retrieving proximity related information based on the subscriber profile information; and

30 a wireless network capable of data transmission for pushing the proximity related information to the mobile subscribers based on the subscriber profile information, the wireless network establishing a continuous connection between the push server and the mobile subscribers.

23. The system of Claim 22 further including a content database containing the proximity related information, the proximity related information retrievable from the content database based on subscriber location information.

5 24. The system of Claim 22 wherein the wireless network includes a plurality of system broadcast antennas transmitting the proximity related information to all mobile subscribers in an immediate area of the plurality of system broadcast antennas.

10 25. The system of claim 24 wherein the proximity related information is coded such that only selected subscribers can use the proximity related information.

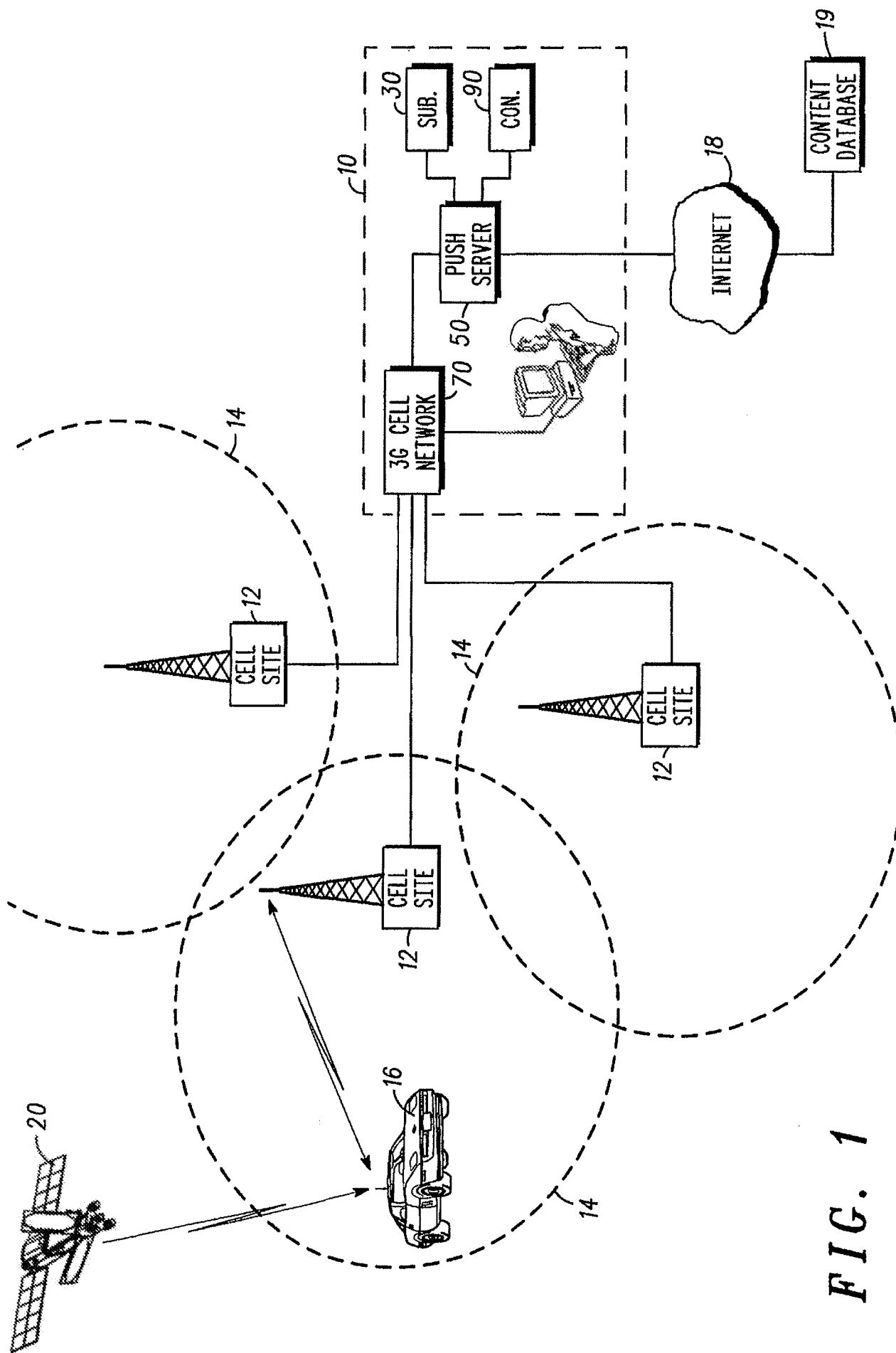
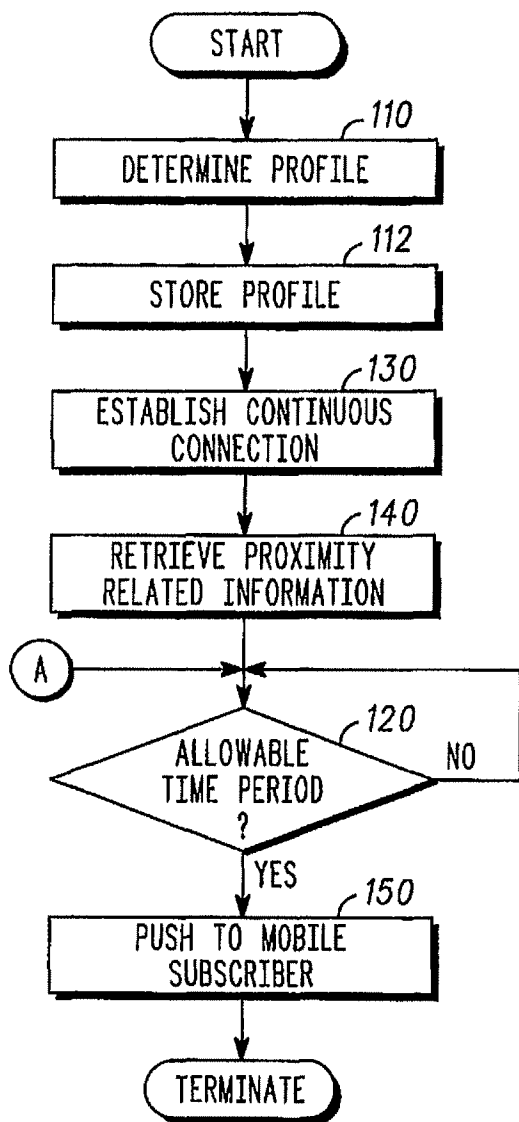
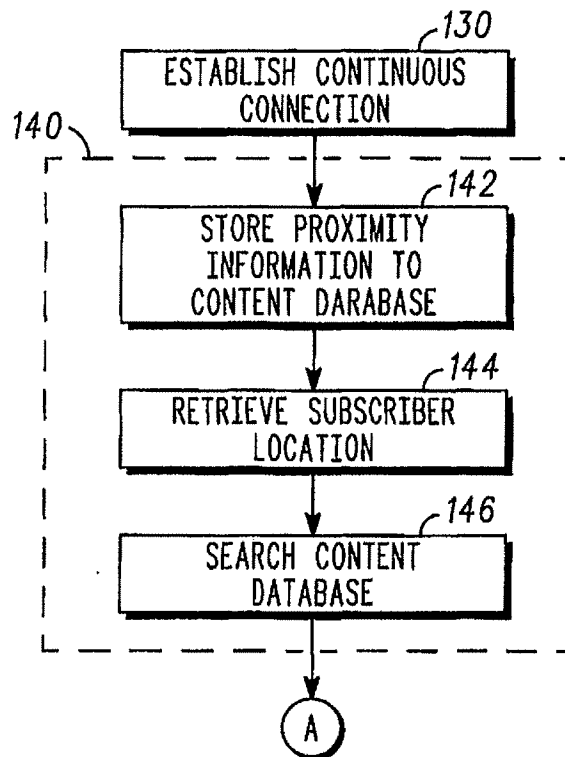
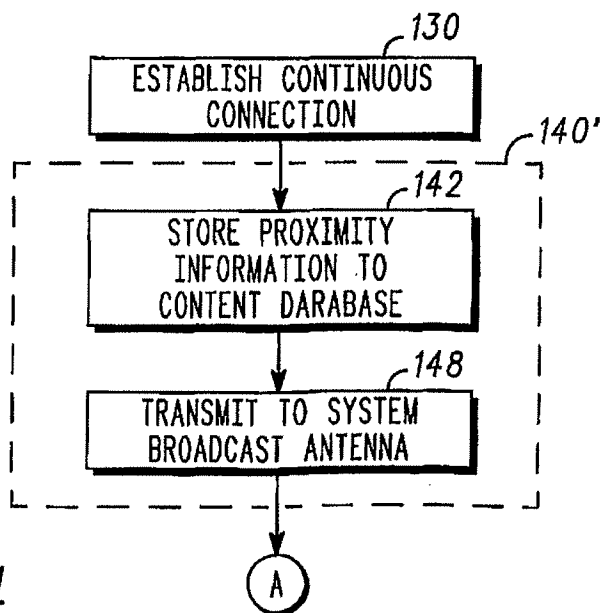


FIG. 1

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*FIG. 2**FIG. 3**FIG. 4*

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04L29/06 H04Q7/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06F G01C H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, IBM-TDB, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Olmos, J

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PCT/US 01/16651

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